

# **FIVE YEARS OF WYOMINGVIEW: A REVIEW OF ACCOMPLISHMENTS AND FUTURE CHALLENGES**

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## **ABSTRACT**

WyomingView, founded in 2002, is part of the USGS/AmericaView program. Its mission is to promote the widespread use of satellite-based remotely sensed data for education and research applications in Wyoming. Since its inception, WyomingView has had many successes promoting remote sensing data use in federal and state government agencies. Grass-roots outreach efforts have introduced remote sensing technology to a growing user group, and through partnerships with other consortia we have built a digital archive of satellite data consisting of more than 500 Landsat, 1950 ASTER and several MODIS images for Wyoming. These images are available in ready-to-use formats at no-cost. Users from Wyoming and 20 other states in the US and 2 Canadian provinces have requested more than 1500 images (or 1 Terra byte) for education and research. Importantly, through WyomingView's internship program, several University of Wyoming undergraduate and graduate students have gained hands-on experience using remote sensing technology for addressing issues such as vegetation mapping, change assessment, and mapping invasive species. This paper highlights some of these accomplishments along with some challenges encountered along the way and looking ahead.

## **INTRODUCTION**

The WyomingView consortium is part of the USGS/AmericaView initiative to promote widespread use of satellite-based remotely sensed data. Last year marked the 5<sup>th</sup> anniversary of WyomingView operations in Wyoming which have included the following activities: outreach and consortium building; data archival distribution; training; and applied research activities. Over these years, through highlight articles and presentations in regional and national conferences, we have highlighted WyomingView's accomplishments areas as a model for other programs with similar goals. This paper provides a succinct overview of those accomplishments and describes the approaches taken to achieve them with the limited resources available. These success stories provide valuable insights for other consortia and programs aimed at promoting remote sensing education and research – in particular targeting the future workforce – the next generation of teachers and researchers. Despite these successes there are challenges ahead if WyomingView (and other AmericaView state programs) is to survive and continue to grow in a less certain funding environment.

## **BUILDING THE USER BASE**

One of the formidable tasks faced by WyomingView was to assemble a user base that was spread throughout Wyoming including personnel in federal, state and tribal government agencies. Unlike its counterparts in other states, WyomingView was not able to reach out to other institutions of higher learning since the University of Wyoming is the only 4-year degree granting institution in Wyoming that offers graduate degree programs in addition to the baccalaureate degree programs. Reaching out to agencies and extension offices was the focus during the first two years of WyomingView's existence. Through numerous face-to-face meetings we promoted the goal and purpose of WyomingView. Simultaneously we identified user needs, existing skills, and current level of remote sensing data adoption at these state, county and local offices. WyomingView outreach activities were described in detail by Driese

and Sivanpillai (2004) and Sivanpillai and Driese (2006), and in particular our efforts to promote remote sensing activities in federal agencies were described by Sivanpillai and Driese (2007b). Targeted outreach efforts, aimed at individual agencies were largely responsible for raising the awareness of WyomingView among the existing and potential users of satellite remotely sensed data.

**Table 1.** Membership in WyomingView consortium

<b>Members</b>	<b>Location</b>
USDOI Bureau of Land Management	Wyoming State Office, Cheyenne, WY
USDA - Natural Resource Conservation Service	Wyoming State Office, Casper, WY
USDA - Forest Service – Rocky Mountain Region	Lakewood, CO
Wyoming State Engineers Office	Cheyenne, WY
Wyoming Game & Fish Department	Cheyenne, WY
Wind River Environmental Quality Commission	Ft. Washakie, WY
SkyTruth Inc.	Shepherdstown, WV

To date, there are 7 members in the WyomingView consortium (Table 1) and we expect new members - mostly from state government agencies and private companies to join WyomingView in the future. For these members, WyomingView provides technical support in the form of consulting prior to data purchase or finalizing work orders. Members also value our unbiased input and feedback prior to undertaking new projects involving remote sensing technology. In several instances WyomingView was able to identify opportunities for joint activities between agencies and in other instances pointed these agencies to appropriate resources available elsewhere.

## **SATELLITE DATA ARCHIVE AND DISTRIBUTION**

Obtaining affordable satellite data in easily usable formats was a major barrier preventing widespread use of satellite data. Unlike GIS data that are available in easy to use formats, satellite data were available mostly in a variety of complex formats that required several pre-processing steps to make them useable for average users in a GIS setting. Image processing software required to perform these pre-processing steps were not available in several offices, but almost all of them had GIS software capable of viewing satellite images. To overcome this barrier we decided to process data in our archive into ready to use formats, eliminating the need for end users to do laborious or specialized pre-processing. This simple strategy was largely responsible for increasing the number of users in agencies throughout the Wyoming (Table 2). Detailed information about Wyomingview data distribution activities and cost benefits to the federal agencies can be found in Sivanpillai and Driese (2007b).

**Table 2.** Requests for Landsat data received and number of scenes delivered

<b>Year</b>	<b>Number of requests</b>	<b>Number of scenes</b>
2003	35	102
2004	75	276
2005	78	202
2006	92	428
2007	93	262
Total	373	1270

The WyomingView data archive continues to grow and includes more than 500 Landsat images (Multispectral Scanner, Thematic Mapper 5, and Enhanced Thematic Mapper Plus), approximately 1800 ASTER scenes collected since 2001, and several MODIS images (8-day composites). Users can browse and request images using web forms and images are delivered through WyomingView's ftp server or on CD/DVD-ROMs. We anticipate that the Landsat collection might be affected if current Landsat satellites fail prior to the anticipated launch of the follow up Landsat

satellite (LDCM) scheduled for 2011. WyomingView will explore opportunities to acquire other satellite data not constrained by licensing issues to add to its archive. AmericaView is currently negotiating with other satellite data vendors to address data gap issues in the event that both Landsat satellites fail prior to the launch of LDCM.

## **TRAINING CURRENT AND FUTURE WORKFORCE**

Training both the current and future workforce in the use of remote sensing data and applications is one of the primary objectives of WyomingView. To date we have conducted many workshops for agency personnel in remote sensing project management and the use of freeware data viewers. These workshops have responded to our members expressed interest in learning how to manage remote sensing projects and data without having to learn complicated image processing techniques using expensive software. In response to these needs, WyomingView developed two short courses: remote sensing project management and working with freeware software. The first a half-day project management seminar, teaches users the specifics of remote sensing based project management. The second uses the free ERDAS Viewfinder available from Leica Geosystems (Atlanta, GA, USA) and focuses on viewing and conducting preliminary analyses of remotely sensed data. Both courses have been offered multiple times in Laramie and other locations across Wyoming. Both courses are offered at no-cost either in Laramie (UW campus) or at locations using a mobile teaching lab (consisting of 13 desktop computers).

Future workforce training will focus on providing internships to UW undergraduate and graduate students interested in working with remote sensing technology. Student interns in the past have spent a semester working on projects that address Wyoming’s agricultural and natural resource issues. To date, WyomingView has offered 13 internships to undergraduate and 4 internships to graduate students at UW. Realizing the value of student training, the Wyoming Agricultural Experiment Station has cost-shared an internship with WyomingView for any student interested in working on Wyoming’s agricultural issues. Leveraged funding like this is critical to WyomingView’s success.

## **APPLIED RESEARCH**

Several applied research projects were implemented with the objective of testing the utility of Landsat data for mapping and monitoring natural resources in Wyoming. Table 3 lists pilot projects WyomingView has conducted along with the collaborating agencies and/or UW academic departments. Findings from these applied research projects are often submitted for peer-reviewed publication (e.g., Sivanpillai and Miller, 2008). We often pursue additional grant funding to continue or extend the work beyond scope of the original pilot projects.

**Table 3.** Applied research projects conducted by WyomingView aimed at testing the utility of satellite remote sensing data

Collaborating agency or partner	Application
USDA Agricultural Research Service, Cheyenne	Rangeland vegetation mapping
Wyoming Game & Fish Department, Jackson	Conifer encroachment mapping
UW – Botany Department	Forest mapping
UW – Renewable Resources Department	Water body mapping in Powder R. Basin
USDOI – Bureau of Land Management	Cheatgrass mapping

These success stories have resulted in new enquiries for more applied research projects using Landsat and ASTER satellite data. However with limited resources it is difficult to take on all requests. Currently we are working with agencies to convert their applied research opportunities to undergraduate or graduate student internships. This could result in UW students gaining experience in addressing real world problems and increase their chances while seeking employment.

## CONCLUSION

In conclusion, WyomingView has been able to leverage a relatively small funding base to help Wyoming users incorporate satellite remote sensing into their activities through targeted outreach and training efforts. The program has resulted in better and more efficient land management, agricultural, educational and other activities in our state and in other states that participate in the broader AmericaView program. For these programs to succeed in the future it will become increasingly important to broaden base funding and leveraged activities and we are currently working with this challenge in mind. Our outreach efforts are yielding rich dividends in terms of data requests received from users in Wyoming and other states along with the number of applications of remote sensing. Other stateviews are witnessing similar trends. Member states are looking for ways to broaden their funding sources to stabilize their activities for the long term. With the availability of new types of data we anticipate increased request for technical help and training sessions. To overcome these challenges WyomingView and AmericaView are working together to identify resources towards sustaining the AmericaView program.

## WEB LINKS

AmericaView Inc: <http://www.americaview.org>

AmericaView Program, USGS: <http://americaview.usgs.gov>

WyomingView: <http://www.wygisc.uwyo.edu/wyview>

Wyoming Geographic Information Science Center: <http://www.wygisc.uwyo.edu>

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